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Using Citation Analysis to Pursue a Core Collection of Journals for Communication Disorders

Steven Black

A citation analysis from a purposive sample of two leading journals is employed to build a tentative core collection of journals in communication disorders. A core collection is defined for this study as those journals that provide 80% of the sample's article citations. The bibliometric concept of "success-breeds-success" is reviewed, and its application to this sample of journals is quantified. The special problems of defining a core collection in a multidisciplinary field are discussed. Data is also provided on the types of publications cited, and the age distribution of cited journals.

The field of communication disorders encompasses the study of impairments and disabilities in speech, language, and hearing. The American Speech-Language-Hearing Association (ASHA), founded in 1925, accredits practitioners, programs, and college and university graduate programs in communication disorders, and has 97,062 members (American Speech-Language-Hearing Association 2000). ASHA's Council of Academic Accreditation (2000) has accredited 253 graduate programs in the United States in speech-language pathology and audiology (www.asha.org/students/caa_programs/caaprog.htm).

Communication disorders draws from multiple disciplines, yet it is clearly a discipline in its own right. It satisfies Kuhn's (1996) characteristics of a discipline, having its own specialized journals, an established professional society, and a special place in the academic curriculum. Accredited professionals, students in programs, and the libraries serving them need to access literature from a wide range of fields. The broad, multidisciplinary nature of communication disorders is demonstrated by the works cited in articles published in journals such as the *Journal of Speech, Language and Hearing Research* and the *Journal of Communication Disorders*. Works cited in these communication-disorders journals draw from publications in many fields, including audiology, neurology, linguistics, medicine, physiology, psychology, psychiatry, education, and special education.

Identifying the most important journals helps professionals use their time efficiently, and helps libraries make the most of their budgets. Typically, an academic library will develop a core collection of journals in each of the disciplines taught in the institution's programs, and also subscribe to additional journals that strengthen and enhance the core collections. But defining a core collection is not easy. Many journals are used in more than one discipline, and titles often cease,

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merge, change names, or are newly created. Also, the quality of individual journals changes over time, so reputation may overestimate or underestimate the current quality of a journal.

Citation Analysis

Citation analysis is an established method for identifying the leading journals that belong in a discipline's core collection. Citation analysis is the systematic, quantitative study of works cited. It is part of the broader field of bibliometrics, the application of mathematical and statistical methods in the study of the use of documents and publication patterns (Osareh 1996). Osareh (1996) reviewed a body of citation analysis research used to rank publications according to their importance, to identify core collections, to measure the impact of publications, and to study subject interrelationships. Despite potential problems with citation analysis data discussed below, measuring cited use in professional journals is a well-established, objective, quantitative method for measuring the value of published literature.

Citation analysis is based on the premise that citations to literature more or less accurately represent the influence of that literature on authors. Cole and Cole (1972) used that premise to show that a small number of researchers produce most scientifically important papers, and then defended the use of citation analysis in a subsequent reply to letters to the editor (Cole and Cole 1974). MacRoberts and MacRoberts (1989) described flaws in this assumption and the practices that flow from it. Formal and informal influences are not always cited, authors may have bias in citing works, authors often cite themselves, types of citation are not consistent, and citation rates vary considerably among disciplines, nations, and times.

Many citation analyses are based on data provided by published citation indexes, notably the Institute for Scientific Information's (ISI) *Journal Citation Reports*, based on data in the *Science Citation Index* (*SCI*) and *Social Science Citation Index* (*SSCI*). Critics of the reliability of data in the ISI databases have identified potential problems with measurement errors caused by title changes, aberrant title abbreviations, and incomplete coverage (Rice et al. 1989). Funkhouser (1996) found that a significant portion of the references in communications journals were not covered in the ISI databases.

Citation analysis has consistently shown there to be a highly skewed distribution of cited works, whereby successful articles gain the most attention, and thus become even more successful. Success-breeds-success is often referred to as the Matthew Effect, from the book of Matthew (13:12): "for unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath." Merton (1968) first described the Matthew Effect in terms of the disproportionate amount of attention given to the work of the most prominent scientists. Models of journal citation distribution models all show a pattern of success-breeds-success, although there is no standard mathematical formula for the skewed distribution of cited works (Oluic-Vukovic 1997). Bensman and Wilder (1998) described in some detail this and related expressions of the skewed distribution of citations, including "Bradford's law of scattering," "Garfield's law of concentration," and the negative binomial distribution. Other success-breeds-success "laws" have been devised by Pareto, Lotka, and Zipf (Oluic-Vukovic, 1997).

All expressions of the distribution have a common model of concentrated use in a small portion of the whole, and a large, gradually diminishing portion that receives little use. According to Bradford (1953), the numbers of periodicals in a nucleus of journals and succeeding zones will follow the formula $l{:}n{:}n^2$. Unfortunately, one has to perform a citation analysis of the journals of a particular discipline to determine the n in Bradford's law of scattering. A core collection can be determined by following Bradford's law, but the law of scattering leaves to reasoned judgment the cutoff between core and other journals. There is no clear boundary for a core collection in Bradford's law, or in any other success-breeds-success model.

A very common, albeit less formal expression of the skewed distribution is known as the "80/20 rule": 80% of uses come from 20% of sources. The 80/20 rule of thumb can be applied to citations, inventories, profits, or journal collections. In business the 80/20 rule can be expressed as "a business gets 80 percent of its activity from 20 percent of its product line" (Rosenberg 1993, 117). The library corollary would be that 20% of the collection receives 80% of the use. One goal of this study will be to measure the degree to which the 80/20 rule of thumb matches patterns of professionals' use of journals in communication disorders.

Problem Statement

A known set of core journals helps one see the boundaries of a discipline (Zipp 1999), and a core collection list is a valuable collection development tool. *Magazines for Libraries* (Katz 1969–97) identified basic periodicals considered by subject specialist librarians to be essential to library collections. However, contributors' interpretations of "essential" vary a great deal, so the number of journals deemed "basic" varies widely among the listed disciplines. Unfortunately, communication disorders is not a subject heading in *Magazines for Libraries* (1997), so its journals do not receive a specialist's treatment there. Neither is communication dis-

orders identified as a separate subject in ISI's *Journal Citation Reports* (Institute for Scientific Information 1996).

The multidisciplinary nature of communication disorders makes identifying a core collection difficult. The corpus of literature devoted exclusively to communication disorders is small, and relatively few journals cover the entire field. As is true in many fields, many important journals are devoted to subspecialties, for example, the *Journal of Fluency Disorders* and *Ear and Hearing.* Many of the most important journals for researchers in communication disorders are associated with other fields, such as the *Journal of the Acoustical Society of America*, *Child Development*, and *Pediatrics*. The literature researchers need thus comes from disparate sources, including sources that are not immediately obvious from titles, subject headings, or classification numbers.

A thorough search in indexes by the author unearthed no published lists of core journals in communication disorders. Therefore, there is a particular need to employ citation analysis to study the bibliometric characteristics of publications serving researchers in communication disorders. This study will address three interrelated research questions. The primary research question is:

- Which journals are frequently cited by publishing researchers in communication disorders?

The method employed also provides data to answer two related questions:

- What proportion of citations come from various types of sources, i.e., journals, books, conferences, tests and assessments, and others?
- What is the age distribution of cited journal articles? That is, for how long do journal articles influence authors?

Method

An independent collection of data was undertaken because citation analysis data published in ISI's *Journal Citation Reports (JCR)* for sciences and social sciences do not include communication disorders as an identified field of study, and because not all significant journals are in the *JCR* data set. Furthermore, citation data in the *JCR* on CD-ROM are divided into separate databases for Science and Social Science. Journals important for communication disorders are divided into two separate data sets. The separated data must be integrated to get a true picture of journal use.

From the population of journals targeted to professionals in communication disorders, a purposive sample of recent volumes of two journals was chosen. Purposive, or judgment, sampling is used when probability sampling is practically impossible (Miller 1991). Probability samples are only possible when the population can be defined, and all members of the population can be listed. Because of the dispersed nature of articles used by researchers in communication disorders, a probability sampling technique was practically impossible for this study. Miller (1991) also states that data from judgment samples only suggest or indicate conclusions, meaning that the purposive sampling technique used here precludes a strictly defined core collection.

The two journals selected were the *Journal of Communication Disorders* and the *Journal of Speech, Language, and Hearing Disorders.* The *Journal of Speech, Language, and Hearing Disorders (JSLHR)* was chosen because of its leadership in the field as the flagship journal of ASHA. Each issue of *JSLHR* has three sections, covering research encompassing disorders of speech, disorders of language, and hearing impairments. This distribution of research articles serves to cover the full field of communication disorders. The *Journal of Communication Disorders (JCD),* an Elsevier journal, also publishes original articles relating to all three areas of disorders of speech, language, and hearing. Both *JSLHR* and *JCD* mostly publish articles based on primary research, and both are known by the author to be highly regarded by the faculty and frequently used by the students in communication disorders at the College of Saint Rose. Both journals state that their purpose is to address topics across the entire field, and both are specifically targeted solely to communication disorders. As mentioned above, many important journals focus on a subspecialty (e.g., audiology, fluency disorders, brain injury, or educational aspects of communication disorders). Many others cover more than communication disorders (e.g., cognitive psychology, linguistics, pediatrics). The two journals chosen accurately express the multidisciplinary scope of the field.

Every cited work from every article in ALL issues of the *Journal of Communication Disorders* from 1997, 1998, and 1999 were entered into a spreadsheet. Data entered included the citing journal, year of the citing journal, cited work, and year of cited work. Full journal names were entered exactly as they appeared in the articles. Other sources were identified by their type, such as "book," "conference," "dissertation." The *JCD* for these three years yielded 2,660 cited works. Equivalent data entered from all issues of the *JSLHR* from 1997 and 1999 yielded 9,034 cited works. Data were not entered for the *JSLHR* for 1998 in order to reduce data entry time, and to avoid having the data from it statistically overwhelm data from the *JCD*.

Only issues published since 1997 were used. It was considered important to measure, as much as possible, the current actual use of journals. It was deemed more important

from a collection development standpoint to see what has been used recently, and less important to know what has been used in the past. A previously reputable journal that has slipped in actual use will then receive its fair place in the measurement of relative importance. Also, citation analysis is unavoidably biased against new journals. Counting citations from older volumes increases that bias.

Since a judgment sample was employed, the degree to which this sample represents the population of communication disorders journals is unknown. Although the total of works cited is 11,704, representing a substantial investment of data entry time, the data were drawn from only two respected sources. These results must be taken as estimates, recognizing that journals cited in all communication disorders journals vary by an unknown amount from the data reported here.

Results

Figure 1 shows the distribution of works cited by type of source (n=11,704). The books category is interpreted rather broadly, and includes reports and manuals, except for test manuals. The tests category is for all tests and assessments, and the manuals that accompany them. "Conferences" includes published proceedings, papers presented, and posters presented at conferences. The "other" category includes dissertations, theses, standards, and computer programs. Notably, of all citations, only two were to any type of Web site. Citations to journal articles comprised 7,792 of the 11,704 works cited.

Figure 2 illustrates the age distribution of cited journal articles, calculated by subtracting the year of the cited article from the year of the citing article. Articles in press were counted as being published in the year of the citing article in hand. As figure 2 shows, the age of cited articles rises quickly to those two years old, peaks at articles five years old, and gradually decreases thereafter. Sources 20 or more years old contributed 16% of all the cited articles. That fact underscores the importance of collection development as a long-term process, and indicates researchers' need to have a reliable archival record of published research.

The appendix lists, in descending order, the shortest possible list of journals that provide 80% of articles cited in the sample (n=7792). The first data column shows the number of citations, and the second shows this number as a percentage of all citations. The rightmost column shows the cumulative subtotal, by percentage, of all citations to journals. The appendix displays data on 103 of the 791 journals that were cited at least once. Cited sources are indeed concentrated in a small number of titles, since 13% of the cited journals provided 80% of the cited articles. Of the cited journals, 31%, or 144 additional journals, would be required to provide 90% of the cited articles. As predicted by the theory of skewed distribution, the "tail" of infrequently cited journals is long. Among the 791 cited journals, 156 are cited only twice, and 361 are cited but once.

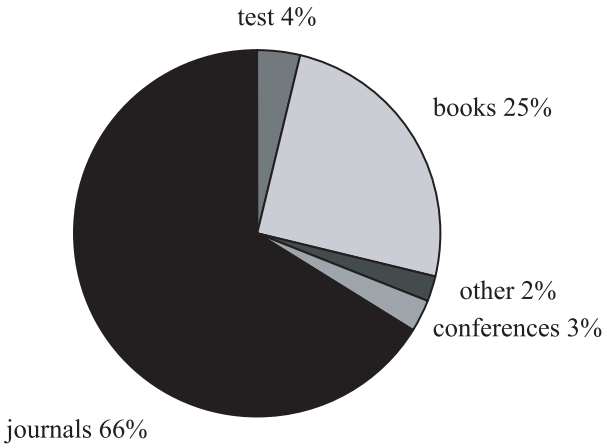

Figure 1. Sources of Citations

Figure 2. Age Distribution of Cited Articles

Title changes complicate the citation analysis. If a journal changed its name, the citation counts for the previous title(s) were added to the current title. The one exception to the grouping together of name changes is the journals that preceded the *Journal of Speech, Language, and Hearing Research*. In addition to the title change for the *Journal of Speech [and Hearing] Disorders*, that journal merged with the *Journal of Speech and Hearing Research* in 1991. The merged journal changed its name from *Journal of Speech and Hearing Research* to *Journal of Speech, Language, and Hearing Research* in 1997. All versions of what is now represented by *Journal of Speech, Language, and Hearing Research* contributed almost one quarter of all cited articles, and 17% of articles cited in the *Journal of Communication Disorders*.

Discussion

The information presented here suggests a core collection in communication disorders, and highlights some characteristics of publishing within the field. Journals and books are the primary sources of cited information. It is noteworthy that within this sample, online journals and Web resources were not cited. As the theory of skewed distribution predicted, a small percentage of journals provided a large percentage of cited references. In this study, 13% of cited journals provided 80% of the citations to journal articles. Articles are used over a long period of time, with fully half of the cited articles being at least 8 years old. The longevity of journal articles emphasizes the need for long-term maintenance of journal collections.

The journals listed in table 1 suggest, but do not define, a core collection. The selection of 80% of cited articles, in this case from journals cited 12 or more times, is an arbitrary cutoff. It makes little sense to say that a journal cited 12 times in this sample is a core journal, and one cited 11 times is not. But the list has to be cut off at some point. Only one journal was cited 12 times, five were cited 11 times, and four were cited 10 times, so there is something resembling a natural break at the 80% mark. Nevertheless, one should not automatically exclude journals not listed here when collecting for communication disorders. The sample used was not large enough to determine that a journal not on the list is not valuable. It is also important to note that the method employed has a bias for established journals. The age of citations shown in figure 2 demonstrates that a new journal has less of a chance to be frequently cited, and a great chance of being left out of appendix A.

Faculty opinion is very important to core collection definition, because faculty know their field, and give assignments that require journal use. Local use studies can provide additional valuable data, since students may use different journals than publishing authors use. Special circumstances must also be considered. For example, the College of Saint Rose's program is ASHA-certified for speech-language pathology, but we have no audiology program. So the serials librarian and the department both believe it is unnecessary to subscribe to the *Journal of the Acoustical Society of America* or *Ear and Hearing*, despite those journals' high standing in table 1.

The general stature of certain medical and scientific journals is well known, but their ranking as core titles for communication disorders came as somewhat of a surprise. Subscriptions to *Pediatrics*, *Science*, *Nature*, and the *New England Journal of Medicine* benefit researchers in this field more than the author would have guessed. The lesson could be that it is important for librarians to protect subscriptions to general titles that serve multiple departments.

Further citation analysis of communication disorders journals could provide a more broadly based and authoritative set of leading journals. Unfortunately, a more reliable list of core journals in communication disorders can only be determined by expanding the sample size. This work would be easier if *Journal Citation Reports* (Institute for Scientific Information 1996) recognized communication disorders as a distinct discipline. As it now stands, there is no way to avoid tedious and time-consuming data entry to pursue a more comprehensive citation analysis. But despite the constrained sample, this study provides objective information suggesting a core of journals in communication disorders.

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Appendix
Core Journals in Communication Disorders (*n*=7,792)

Cited Journal	Frequency of Journal Cites	% of Journal Cites	Cumulative% of Journal Cites
Journal of Speech and Hearing Research	1344	17.25	17.25
Journal of the Acoustical Society of America	636	8.16	25.41
Journal of Speech and Hearing Disorders and *Journal of Speech Disorders*	396	5.08	30.49
Brain and Language	189	2.43	32.92
Journal of Speech, Language, and Hearing Research	161	2.07	34.98
Journal of Fluency Disorders	138	1.77	36.76
Ear and Hearing	120	1.54	38.30
Language, Speech and Hearing Services in Schools	117	1.50	39.80
Journal of Communication Disorders	108	1.39	41.18
Journal of Phonetics	108	1.39	42.57
Journal of Child Language	94	1.21	43.78
Applied Psycholinguistics	93	1.19	44.97
Child Development	90	1.16	46.12
ASHA	81	1.04	47.16
American Journal of Speech-Language Pathology	76	0.98	48.14
Clinical Linguistics and Phonetics	69	0.89	49.02
Journal of Memory and Language and *Journal of Verbal Learning and Verbal Behavior*	64	0.82	49.85
Pediatrics	61	0.78	50.63
British Journal of Disorders of Communication and *European Journal of Disorders of Communication*	60	0.77	51.40
Journal of Voice	60	0.77	52.17
Science	58	0.74	52.91
Cognition	57	0.73	53.64
Seminars in Hearing	57	0.73	54.38
Psychological Review	55	0.71	55.08
Topics in Language Disorders	55	0.71	55.79
Folia Phoniatrica et Logopaedica	54	0.69	56.48
Laryngoscope	50	0.64	57.12
Journal of the American Academy of Audiology	47	0.60	57.73
Perception and Psychophysics	46	0.59	58.32
Aphasiology	44	0.56	58.88
Journal of Child Psychology and Psychiatry and Allied Disciplines	44	0.56	59.45
Phonetica	44	0.56	60.01
Language and Speech	43	0.55	60.56
Developmental Psychology	41	0.53	61.09
Neuropsychologia	41	0.53	61.61
Nature	40	0.51	62.13
Journal of Learning Disabilities	38	0.49	62.62
Journal of Neurophysiology	37	0.47	63.09
Archives of Otolaryngology Head and Neck Surgery	36	0.46	63.55
Developmental Medicine and Child Neurology	36	0.46	64.01
Electroencephalography and Clinical Neurophysiology	35	0.45	64.46
Journal of Autism and Developmental Disorders	35	0.45	64.91
Journal of Experimental Child Psychology	32	0.41	65.32

Audiology	31	0.40	65.72
Journal of Experimental Psychology: Human Perception and Performance	31	0.40	66.12
Acta Otolaryngologica	29	0.37	66.49
Language	29	0.37	66.86
American Journal of Audiology	28	0.36	67.22
Hearing Research	28	0.36	67.58
Journal of Pediatrics	27	0.35	67.93
Perceptual and Motor Skills	27	0.35	68.28
Psychological Bulletin	27	0.35	68.62
Archives of Neurology	26	0.33	68.96
Brain	26	0.33	69.29
Augmentative and Alternative Communication	25	0.32	69.61
American Journal of Otology	24	0.31	69.92
Journal of Psycholinguistic Research	24	0.31	70.23
Annals of Otology, Rhinology and Laryngology	23	0.30	70.52
Cortex	23	0.30	70.82
British Journal of Audiology	22	0.28	71.10
Experimental Brain Research	22	0.28	71.38
First Language	21	0.27	71.65
Neurology	21	0.27	71.92
Quarterly Journal of Experimental Psychology (A and B)	21	0.27	72.19
Scandinavian Audiology	21	0.27	72.46
Language Acquisition	20	0.26	72.72
New England Journal of Medicine	20	0.26	72.97
Speech Monographs and *Communication Monographs*	20	0.26	73.23
American Journal of Public Health	19	0.24	73.47
Annals of Neurology	19	0.24	73.72
Journal of Educational Psychology	19	0.24	73.96
Seminars in Speech and Language	19	0.24	74.20
Volta Review	19	0.24	74.45
Clinical Aphasiology	18	0.23	74.68
Cognitive Neuropsychology	18	0.23	74.91
Journal of Experimental Psychology: Learning, Memory and Cognition	18	0.23	75.14
Journal of Applied Physiology	17	0.22	75.36
Memory and Cognition	17	0.22	75.58
Annals of Dyslexia	16	0.21	75.78
Cognitive Psychology	16	0.21	75.99
Journal of Applied Behavior Analysis	16	0.21	76.19
Journal of the Academy of Rehabilitative Audiology	16	0.21	76.40
Linguistic Inquiry	16	0.21	76.60
Otolaryngology Head and Neck Surgery	16	0.21	76.81
Speech Communication	16	0.21	77.01
Brain Research	15	0.19	77.21
Merrill-Palmer Quarterly	15	0.19	77.40
Monographs of the Society for Research in Child Development	15	0.19	77.59
American Journal of Medical Genetics	14	0.18	77.77
Audiology Today	14	0.18	77.95
Cleft Palate-Craniofacial Journal	14	0.18	78.13
International Journal of Pediatric Otorhinolaryngology	14	0.18	78.31
Journal of Gerontology (split into A and B)	14	0.18	78.49
Journal of Neurology, Neurosurgery, and Psychiatry	14	0.18	78.67
American Annals of the Deaf	13	0.17	78.84
Dysphagia	13	0.17	79.00
Infant Behavior and Development	13	0.17	79.17
JAMA	13	0.17	79.34
Journal of the American Academy of Child and Adolescent Psychiatry	13	0.17	79.50
Psychology and Aging	13	0.17	79.67
Sign Language Studies	13	0.17	79.84
British Journal of Psychology	12	0.15	79.99